International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 3 Issue 5, August 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Campus Area Networks of the University using MPLS, VLANs and the Internet

Khin Aye Thu, Soe Soe Mon, Thida Soe

Lecturer, Faculty of Computer Systems and Technologies, University of Computer Studies, Hinthada, Myanmar

How to cite this paper: Khin Aye Thu | Soe Soe Mon | Thida Soe "Campus Area Networks of the University using MPLS, VLANs and the Internet" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-5, August 2019, pp.1467-1470, **https://doi.org/10.31142/ijtsrd26651**

IJTSRD26651

ABSTRACT

Multiprotocol Label Switching (MPLS) primarily implements and uses labels for making routing decisions. The label-based switching mechanism enables the network packets to flow on any protocol. MPLS operates by assigning a unique label or identifier to each network packet. The label consists of the routing table information, such as the destination IP address, bandwidth and other factors as well as source IP and socket information. The router can refer only to the label to make the routing decision rather than looking into the packet. A VLAN (virtual LAN) abstracts the idea of the local area network (LAN) by providing data link connectivity for a subnet. One or more network switches may support multiple, independent VLANs, creating Layer 2 (data link) implementations of subnets. A VLAN is associated with a broadcast domain. It is usually composed of one or more Ethernet switches.

KEYWORDS: *MPLS, IP, VLAN, broadcast domain and Ethernet*

INTRODUCTION

MPLS supports IP, Asynchronous Transfer Mode (ATM), frame relay, Synchronous Optical Networking (SONET) and Ethernet-based networks. MPLS is designed to be used on both packet-switched networks and circuit-switched networks. MPLS can encapsulate packets of various network protocols.

VLANs allow network administrators to group hosts together even if the hosts are not directly connected to the same network switch. Because VLAN membership can be configured through software, this can greatly simplify network design and deployment. VLANs allow networks and devices that must be kept separate to share the same physical cabling without interacting, improving simplicity, security, traffic management, or economy.

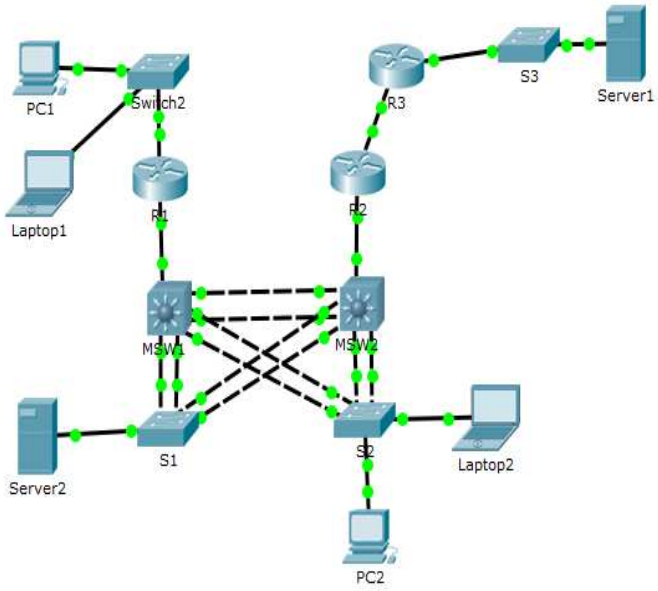

Fig.1 Campus Area Networks using cisco packet tracer

Figure 1 shows that the design of the campus area network.

Table1: Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0 (MPLS)	172.16.12.10	255.255.255.0	N/A
	G0/1 (Server_Farm)	192.168.100.250	255.255.255.0	N/A
R2	G0/0 (Internet)	10.10.10.10	255.255.255.0	N/A
	G0/1.10 (Campus 1)	192.168.10.0/24	255.255.255.0	N/A
	G0/1.20 (Campus 2)	192.168.20.0/24	255.255.255.0	N/A
	G0/1.30 (Campus 3)	192.168.30.0/24	255.255.255.0	N/A
	G0/1.100 (Server_Farm)	192.168.100.0/24	255.255.255.0	N/A
R3	G0/0	10.10.10.11	255.255.255.0	N/A
	G0/1	192.168.11.1	255.255.255.0	N/A
MSW1	G0/1			
	F0/19-20			
	F0/21-22			
	F0/23-24			
MSW2	G0/1			
	F0/19-20			
	F0/21-22			
	F0/23-24			
PC-1	NIC	172.16.12.11	255.255.255.0	172.16.12.10
PC-2	NIC	192.168.10.1	255.255.255.0	192.168.10.254
Laptop1	NIC	172.16.12.12	255.255.255.0	172.16.12.10
Laptop2	NIC	192.168.10.2	255.255.255.0	192.168.10.254
Server1	NIC	192.168.11.100	255.255.255.0	192.168.11.1
Server2	NIC	192.168.100.100	255.255.255.0	192.168.100.250

Router R1 Configuration:

```
Router>enable
Router#conf t
Router(config)#Hostname R1
R1(config)#interface g0/0
R1(config-if)#ip address 172.16.12.10 255.255.255.0
R1(config-if)#no shut
R1(config)#exit
R1(config)#interface g0/1
R1(config-if)#ip address 192.168.100.250 255.255.255.0
R1(config-if)#no shut
R1(config-if)#exit
R1(config)#exit
R1# copy running-config startup-config
```

Router R2 Configuration:

```
Router>enable
Router#conf t
Router(config)#Hostname R2
R2(config)#interface g0/0
R2(config-if)#ip address 10.10.10.10 255.255.255.0
R2(config-if)#no shut
R2(config)#exit
R2(config)#interface g0/1
R2(config-if)#no ip address
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#interface g0/1.10
R2(config)#Encapsulation dot1q 10
R2(config-if)#ip address 192.168.10.254 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#interface g0/1.20
R2(config)#Encapsulation dot1q 20
R2(config-if)#ip address 192.168.20.254 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#interface g0/1.30
R2(config)#Encapsulation dot1q 30
R2(config-if)#ip address 192.168.30.254 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#interface g0/1.100
R2(config)#Encapsulation dot1q 100
R2(config-if)#ip address 192.168.100.251 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#exit
R2# copy running-config startup-config
```

Router R3 Configuration:

```
Router>enable
Router#conf t
Router(config)#Hostname R3
R3(config)#interface g0/0
R3(config-if)#ip address 192.168.3.1 255.255.255.0
R3(config-if)#no shut
R3(config)#exit
R3(config)#interface s0/0/0
R3(config-if)#ip address 10.10.10.11 255.255.255.0
R3(config-if)#no shut
R3(config-if)#exit
```

```
R3(config)#interface g0/1
R3(config-if)#ip address 192.168.11.1 255.255.255.0
R3(config-if)#no shut
R3(config-if)#exit
R3(config)#exit
R3# copy running-config startup-config
```

Multilayer Switch 1 Configuration:

```
Switch>enable
Swith#conf t
Switch(config)#Hostname MSW1
MSW1(config)#vlan 10
MSW1(config-vlan)#name LAN
MSW1(config-vlan)#exit
MSW1(config)#vlan 100
MSW1(config-vlan)#name Server_Farm
MSW1(config-vlan)#exit
MSW1(config)#
MSW1config)#interface range f0/19-20
MSW1(config-if)#switchport mode access
MSW1(config-if)#switchport access vlan 10
MSW1(config-if)#exit
MSW1(config)#
MSW1config)#interface range f0/21-22
MSW1(config-if)#switchport mode access
MSW1(config-if)#switchport access vlan 10
MSW1(config-if)#exit
MSW1(config)#
MSW1config)#interface range f0/23-24
MSW1(config-if)#switchport mode access
MSW1(config-if)#switchport access vlan 10
MSW1(config-if)#exit
MSW1(config)#int port-channel 1
MSW1(config-if)#switchport trunk encapsulation dot1q
MSW1(config-if)#switchport mode trunk
MSW1(config-if)#switchport trunk allowed vlan1,10,100
MSW1(config-if)#exit
MSW1(config)#int port-channel 2
MSW1(config-if)#switchport trunk encapsulation dot1q
MSW1(config-if)#switchport mode trunk
MSW1(config-if)#switchport trunk allowed vlan1,10,100
MSW1(config-if)#exit
MSW1(config)#int port-channel 3
MSW1(config-if)#switchport trunk encapsulation dot1q
MSW1(config-if)#switchport mode trunk
MSW1(config-if)#switchport trunk allowed
vlan1,10,100
MSW1(config-if)#exit
```

Multilayer Switch 2 Configuration:

```
Switch>enable
Swith#conf t
Switch(config)#Hostname MSW2
MSW2(config)#vlan 10
MSW2(config-vlan)#name LAN
MSW2(config-vlan)#exit
MSW2(config)#vlan 100
MSW2(config-vlan)#name Server_Farm
MSW2(config-vlan)#exit
MSW2(config)#
MSW2config)#interface range f0/19-20
MSW2(config-if)#switchport mode access
MSW2(config-if)#switchport access vlan 10
MSW2(config-if)#exit
MSW2(config)#
MSW2config)#interface range f0/21-22
MSW2(config-if)#switchport mode access
MSW2(config-if)#switchport access vlan 10
MSW2(config-if)#exit
MSW2(config)#
MSW2config)#interface range f0/19-20
MSW2(config-if)#switchport mode access
MSW2(config-if)#switchport access vlan 10
MSW2(config-if)#exit
MSW2(config)#int port-channel 1
MSW2(config-if)#switchport trunk encapsulation dot1q
MSW2(config-if)#switchport mode trunk
SW2(config-if)#switchport trunk allowed vlan1,10,100
MSW2(config-if)#exit
MSW2(config)#int port-channel 2
MSW2(config-if)#switchport trunk encapsulation dot1q
MSW2(config-if)#switchport mode trunk
MSW2(config-if)#switchport trunk allowed vlan1,10,100
MSW2(config-if)#exit
MSW2(config)#int port-channel 3
MSW2(config-if)#switchport trunk encapsulation dot1q
MSW2(config-if)#switchport mode trunk
MSW2(config-if)#switchport trunk allowed vlan1,10,100
MSW2(config-if)#exit
MSW2(config)#int g0/1
MSW2(config-if)#switchport trunk encapsulation dot1q
MSW2(config-if)#switchport mode trunk
MSW2(config-if)#switchport trunk allowed vlan1,10,100
MSW2(config-if)#exit
```

Configure VLAN on S1:

```
Switch>enable
Swith#conf t
Switch(config)#Hostname S1
S1(config)#vlan 100
S1(config-vlan)#name Server_Farm
S1(config-vlan)#exit
S1(config)#interface f0/1
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 100
S1(config-if)#exit
S1(config)#int port-channel 2
S1(config-if)#switchport trunk encapsulation dot1q
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk allowed vlan1,10,100
S1(config-if)#exit
S1(config)#int port-channel 3
S1(config-if)#switchport trunk encapsulation dot1q
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk allowed vlan1,10,100
S1(config-if)#exit
```

Configure VLAN on S2:

```
Switch>enable
Swith#conf t
Switch(config)#Hostname S2
S2(config)#vlan 10
S2(config-vlan)#name LAN
S2(config-vlan)#exit
S2(config)#interface f0/1
S2(config-if)#switchport mode access
S2(config-if)#switchport access vlan 10
S2(config-if)#exit
S2(config)#interface f0/2
S2(config-if)#switchport mode access
```

```
S2(config-if)#switchport access vlan 10
S2(config-if)#exit
S2(config)#int port-channel 2
S2(config-if)#switchport trunk encapsulation dot1q
S2(config-if)#switchport mode trunk
S2(config-if)#switchport trunk allowed vlan1,10,100
S2(config-if)#exit
S2(config)#int port-channel 3
S2(config-if)#switchport trunk encapsulation dot1q
S2(config-if)#switchport mode trunk
S2(config-if)#switchport trunk allowed vlan1,10,100
S2(config-if)#exit
```

ADVANTAGES AND DISADVANTAGES OF MPLS

The advantages of MPLS are implementing traffic-engineering, implementing multi-service networks and improving network resiliency with MPLS fast reroute. The advantages of MPLS include enhances data integrity. By being able to select the perfect routes and heal the network should the route go down, your network will remain in working order through some faults (if configured correctly). It also allows for prioritization and other enhancements. The only real disadvantage to MPLS is that you will generally need to upgrade your equipment unless you have routers that are field upgradeable. However, when you consider the uptime in this environment and the better paths that you can utilize, it is a expense that is well worth it.

CONCLUSION

Multiprotocol Label Switching (MPLS) is a routing technique in telecommunications networks that directs data from one node to the next based on short path labels rather than long network addresses, thus avoiding complex lookups in a routing table and speeding traffic flows.

REFERENCES

[1] CCNA Routing and Switching Courses, University of Computer Studies, Mandalay, 2013.

[2] Gyan Prakash Pal, Sadhana Pal Faculty of Electronics & Communication Engineering Department, SIT, Meerut, VGI, Greater Noida (India) "Virtual Local Area Network (VLAN)" International Journal of Scientific Research Engineering & Technology (IJSRET) Volume 1, Issue 10 pp 006-010, January 2013.

[3] JAMES F.KUROSE, KEITH W.ROSS, "COMPUTER NETWORKING", A Top-Down Approach, 6 th Edition.

[4] Minlan Yu and Jennifer Rexford, Princeton University Xin Sun and Sanjay Rao, Purdue University Nick Feamster, Georgia Institute of Technology "A Survey of Virtual LAN Usage in Campus Networks" IEEE Communications Magazine , July 2011.

[5] Surabhi Surendra Tambe Final year Btech EXTC student, Electrical Engineering Department, VJTI, Matunga, Mumbai, India "Understanding Virtual Local Area Networks" International Journal of Engineering Trends and Technology (IJETT)- Volume 25 Number 4- July 2015.